Manufacturing Engineering Project

TITLE:DESIGN AND FABRICATION OF SOLAR/GAS POWERED WATER DISTILLER

Project Group Members (As per sequence as listed in Project List)	Internal Advisor(s)	External Advisor
1.Hammad Ali (IM-117) 2.Azam Ali (IM-109) 3.Syeda Mehwish Abid (IM-106) 4.Rafay Hasan (IM-123)	1 Dr.Maqsood Ahmed (Co-Chairman ,IMD)	

Project Group No.: 11

Introduction:

UNDERSTANDING THE PROCESS:

- **The action of purifying a liquid by a process of heating and cooling.**
- **The heating action drip down the impurities having higher melting and boiling points.**

SOURCE OF ENERGY FOR HEATING:

- **The totally gas based system is un-economical to use.**
- **Utilizing the SOLAR energy in day time.**
- **While the rest of the time,GAS will be use.**

COOLING(CONDENSATION):

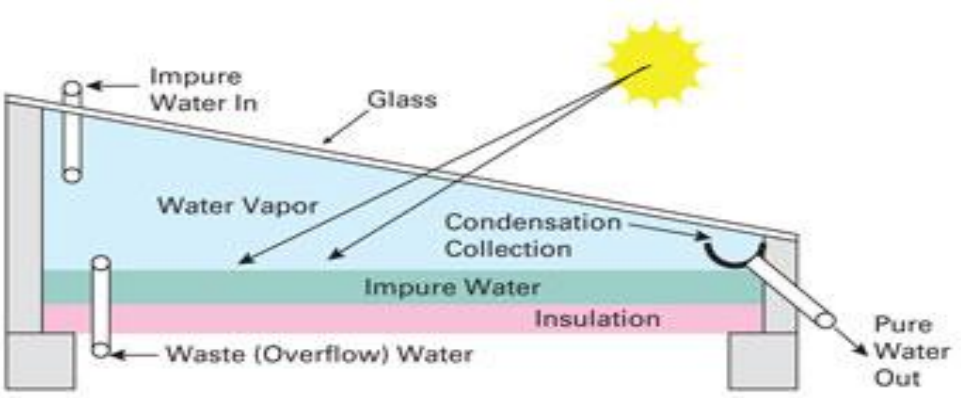
- **Search for best condensing source.**
- **Metals(steel) ,plastic, glass etc.**

Literature Review:

- **DISTILLATION TECHNIQUES:**

SOLAR STILLS

In a solar still, impure water is filled in the capacitive trays housing by the STILL, where it is evaporated by the sun through clear plastic. The pure water vapor condenses on the cool inside plastic surface and drips down off the low point , where it is collected and removed.



Literature Review:

<u>SOLAR COLLECTORS</u>:The design comprises of a reflective stainless sheet curved to form a parabola which would concentrate a line of intense sunlight at the focal line of the parabolic sheet. This heat would then be harnessed for distillation.

Project Scope:

ECONOMICAL-PROJECT:

- **Energy sources and parts used are of low budget.**
- **Solar pannels are avoided due to high cost.**
- **Sufficient energy to vaporize water.**

PRODUCTIVE PROJECT:

- **The distiller must satisfy the water needs of a family of atleast 5 person.**
- **Solar energy production is atleast 5 to 6 litres of water.**
- **Per hour production is about 1.5litre (on peak time).**
- **Normally 1litre production .**

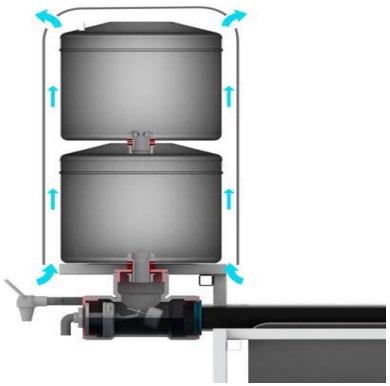
Aim & Objectives:

PROBLEM IDENTIFICATION:

- Solar still is a new experience.
- Production rate may be low.
- High temperature achievement.

POSSIBLE SOLUTIONS:

- Proto-type testing
- Approaching solar colector rather than solar stills.
- Gas nozzles will use to increase production rate.



Design Process And Methodology:

The project is carried out through procedures of research, study of scientific theory, and practical experimentation.

The scope of the project is technical which means that the construction and working are given higher priority than aesthetics.

There is constant communication and interaction for valuable feedback and advice from the advisor.

Research is conducted to figure out the most economical equipment for getting pure distilled water using the solar energy.

Calculations:

Energy required to distil water:

- **Heat of vaporization of water = 2257 kilo joules/kg**
- **Specific heat of water = 4.19 kilo joule /kg/Kelvin**
- **Heat absorbed ,q= C x M x dT**
- **C = specific heat**
- **M = mass**
- **dT = temperature difference in Celsius**
- **Total energy required for distillation (Q)= E1 + E2**
- **E1=Energy to reach boiling point.**
- **E2=Energy required for phase transaction.**

Calculations:

E1 = C x M x dT

E2 = M x L

Hence Q =(C x M x dT) + (M x L)

= M (CdT + L)

=M (4.19 x (100-30) + 2257)=M x 2550.3

WATER QUANTITY(LITRE)	ENERGY REQUIREMENTS(KJ)
1	2250.3
2	5016.8
3	7650.9
4	9000.6
5	12751.5
6	15301.8

What to Conclude?

KEY PARAMETERS TO BE EXECUTED:

- **Simultaneous heating(vaporizing) and condensing.**
- **Control flow of water into the system.**
- **Design optimization techniques.**
- **Simultaneous condensing and collecting.**
- **Integration of design concepts.**

Remaining Work:

S.NO	ACTIVITY	START	FINISH
1	PROTO-TYPE TESTING	20-05-2015	24-05-2015
2	FABRICATION OF SELECTED DESIGN	25-05-2015	20-06-2015
3	FINAL REPORT PREPARATION	22-06-2015	25-07-2015
4	PREPARATION FOR FINAL VIVA	01-08-2015	31-08-2015
5	& PRESENTATION	01-09-2015	20-09-2015
6	HANDING OVER DELIVEREABLE	OCTOBER	

References:

BOOKS:

- **Project Report on Solar water purifier by "National Institute of Design Ahmedabad"**
- **WIKI BOOKS(an open guide)**
- **"Solar Distillation Practice For Water Desalination" by Dr. G N Tiwari, Professor of Energy Studies, Indian Institute of Technology, Delhi, India**

LINKS:(web-sites)

- **www.engineeringforchange.org**
- **www.motherearthnews.com**
- **https://en.wikipedia.org/**